## WE CLAIM:

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1. A wire bonding method, comprising the steps of:

forming a semiconductor substrate with a copper (Cu) interconnect material;

fabricating a copper (Cu) bond pad;

depositing a tantalum (Ta) layer onto the substrate;

patterning and etching the tantalum (Ta) layer; and

bonding an aluminum (Al) wire with the tantalum (Ta) layer;

wherein a portion of the tantalum (Ta) layer bonds with the copper (Cu) bond pad, and another portion of the tantalum (Ta) layer forms a tantalum aluminide (TaAl<sub>3</sub>) compound.

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2. The method of claim 1, wherein the wire is a wire selected from the group consisting of an aluminum wire, an aluminum alloy wire, and an aluminum-coated gold wire.

3. The method of claim 1, wherein thickness of the tantalum (Ta) layer is controlled such that a portion of the tantalum (Ta) layer bonds with the copper (Cu) bond pad, and another portion of the tantalum (Ta) layer

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forms a tantalum aluminide (TaAl<sub>3</sub>) compound.

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The method of claim 1, wherein thickness of the tantalum (Ta) layer is between 300 to 1000 angstroms (Å).

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5. The method of claim 1, wherein the aluminum (Al) wire is bonded onto the tantalum (Ta) layer by wedge bonding.

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6. The method of claim 1, further comprising the step of performing a heat treatment after the bonding step.

7. The method of claim 1 further comprising the step of packaging the substrate in a package consisting of a plastic package and a hermetic package.

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8. The method of claim 1, wherein the tantalum (Ta) layer is patterned by a method consisting of negative tone pad masking, photoresist patterning, and photolithography.

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9. The method of claim 1, wherein the substrate is a multi-layered

## interconnect structure.

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10. A when bonding method, comprising the steps of:

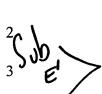
forming a passivation layer on a semiconductor substrate;

bonding\a wire onto the passivation layer; and

encapsulating a bond pad made from an interconnect material, wherein the wire is more metallurgically stable than the interconnect material;

wherein a portion of the passivation layer forms a metallurgical bond with the interconnect material;

wherein a mechanical and electrical connection is provided between the interconnect material and the wire, with the passivation layer disposed therebetween.



11. The method of claim 10, wherein the wire is a wire selected from the group consisting of an aluminum wire, an aluminum alloy wire, and an aluminum-coated gold wire.

12. The method of claim 10, wherein the passivation layer is a tantalum (Ta) layer.

1	13.	The method of claim 10, wherein the wire is bonded onto the passivation
2 579	>	layer by wedge bonding.
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1	14.	The method of claim 10, further comprising the step of performing a heat
2		treatment after the bonding step.
<u> </u>	15.	The method of claim 10, wherein the substrate is a multi-layered
1		interconnect structure.
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	16.	A semiconductor device, comprising:
2 2		a substrate;
35 44		a copper (Cu) bond pad formed on the substrate;
u 24·· cim cim feng feng feng feng feng feng feng feng		a tantalum (Ta) layer encapsulating the copper (Cu) bond pad;
5		wherein a portion of the tantalum (Ta) layer bonds with the copper (Cu)
6	bond	pad, and another portion of the tantalum (Ta) layer forms a tantalum
7	alumi	nide (TaAl <sub>3</sub> ) compound.
1	17.	The device of claim 16, wherein the substrate is a multi-layered
2		interconnect structure.

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- 18. The device of claim 16, wherein the tantalum (Ta) layer is bonded with the copper (Cu) bond pad using wedge bonding.
- 19. The device of claim 16, wherein the substrate is packaged in one of the group consisting of a plastic package and a hermetic package.
- 20. The device of claim 16, wherein thickness of the tantalum (Ta) layer is between 300 to 1000 angstroms (Å).